REMARKS/ARGUMENTS

The claims are 27-35, 38-40, 42-44 and 47-51. Claim 34 has been amended to incorporate the subject matter of claims 36 and 37. Accordingly, claims 36 and 37 have been canceled. Claim 40 has been amended to incorporate the subject matter of claim 41, and accordingly claim 41 has been canceled. Claim 44 has been amended to incorporate the subject matter of claims 45 and 46, and accordingly claims 45 and 46 have been canceled. In addition, claim 47 has been amended to better define the invention. Support may be found, *inter alia*, in the disclosure at FIG. 12a. Reconsideration is expressly requested.

Claims 27-31 and 48-51 were rejected under 35 U.S.C. 103(a) as being unpatentable over *Malsbenden et al DE 4341040* in view of *Amaral U.S. Patent No. 4,852,534*. The remaining claims are rejected under 35 U.S.C. 103(a) as being unpatentable over *Malsbenden et al DE '040* in view of *Amaral* and *Bing et al. U.S. Patent No. 5,947,065* (claim 32), *Amaral* and *Stelzer et al U.S. Patent No. 6,237,569* (claim 33), *Bing et al.* (claims 34-38), or *Stelzer et al* (claims 39-47).

Essentially the Examiner's position was that *Malsbenden et al DE '040* discloses the cast part and method recited in the claims except for features which were said to be taught by the secondary references to *Amaral*, *Bing et al*, and *Stelzer et al*.

This rejection is respectfully traversed.

As set forth in independent claims 27, 34 as amended, 40 as amended, and 44 as amended, Applicant's invention provides a cast part for an internal combustion engine with respect to four different crank case types (products made). Claim 27 relates to a cast crankcase including embedded tubes for lubrication of crankshaft bearings and camshaft bearings. Claim 34 as amended, relates to a cast crankcase including at least one embedded tube which forms a supply line for piston cooling. Amended claim 40 relates to a cast crankcase including at least one embedded tube, which forms a pressurized oil line to a cylinder head. Amended claim 44 relates to a cast crankcase including at least one embedded tube which forms a fuel supply line.

In addition, as set forth in claim 48 as amended, Applicant's invention provides a method for manufacturing a cast crankcase.

In each of claims 27 and amended claims 34, 40 and 44, at least one tube is precisely embedded inside of the crankcase during casting of the crankcase. Then the embedded tube is cut during a simple mechanical step (e.g. by drilling of a duct or opening). After that mechanical measure, the desired supply system for oil or fuel exists inside of the crankcase.

As recited in claim 27, individual tubes each leading to one crankshaft bearing and to one camshaft bearing are cast in during casting of the crankshaft. By subsequently introducing the main oil duct through drilling, the tubes are drilled through.

As recited in claim 34 as amended, the supply line for piston cooling which is embedded as a tube is subsequently mechanically opened at determined points for inserting spray nozzles in order to spray oil directed into a cylinder chamber.

As recited in claim 40 as amended, an oil line to the cylinder head is implemented as a tube and is embedded during casting of the crankcase in the predetermined position. By subsequently introducing the main oil duct through drilling, the connection of the oil line to the oil lube is produced.

As recited in claim 44 as amended, a fuel supply line is implemented as an embedded tube. In the course of finishing measures on the cast crankcase (mechanical introduction of openings for fuel pumps), the embedded tube is cut and/or cut through at pre-determined locations.

With respect to the rejection of claims 27-33 and 48-51, the Examiner relies on a combination of *Malsbenden et al.* with *Amaral*, *Bing et al*, and *Stelzer et al.* The primary reference to *Malsbenden et al.* is directed to improving the lubrication supply system towards the bearings and saving finishing effort by avoiding guide ducts being subsequently mechanically introduced into the cast crankcase. Therefore, *Malsbenden et al.* suggests using a tooth system being generated prior to casting by joining a main tube (which later becomes the main oil duct) and several secondary guide ducts (which are leading to the crankshaft

bearings) together. After that, the pre-manufactured tube system is embedded inside of the crankcase during casting of the latter.

The arrangement of *Malsbenden et al.* has the following disadvantages:

a) The crankcase requires high manufacturing effort and costs. It is very difficult to manufacture the necessary tube system because the secondary guide ducts which lead to the respective bearings have to be fixed to the main oil duct very precisely as far as the positions and the correct angles between secondary guide ducts and main oil duct are concerned. Thus, the kind of cast crankcase contemplated by *Malsbenden et al.* is very expensive.

b) It is very difficult to embed the pre-manufactured tube system of *Malsbenden et al.* into the crankcase during casting. Embedding can be achieved only by using the lost foam casting method. It is not possible to make a cast crankcase with an embedded complete tube system by using a conventional casting method which requires several solid cores and core units which are mounted into a solid lost outer mold or into a permanent

outer mold. A complex tube system including the main oil duct and several secondary ducts cannot be integrated into the cores and into the outer mold prior to casting; however, a crankcase made by lost foam method is more expensive than a crankcase made by a conventional casting method.

Applicant's cast part as recited in claims 27-33 differs from the crankcase described by *Malsbenden et al.* in several aspects:

a. Individual tubes are embedded inside of the crankcase (there is not a tube system including the main oil duct).

b. The individual tubes are bent so that each tube can be used to supply two different bearings with oil (one crankshaft bearing and one camshaft bearing).

c. The bends of the embedded tubes are each located at a position at which the main oil duct subsequently introduced into the cast crankcase runs.

d. The main oil duct is mechanically introduced into the cast crankcase through drilling as a result of which the embedded individual tubes are opened. By means of one simple mechanical step, the complete lubricant supply system towards the crankshaft bearings and the camshaft bearings is produced.

The secondary reference to *Amaral* discloses a completely different kind of an oil supply system. *Amaral* teaches that the oil flow can be independently controlled by means of a tubular oil flow restrictor system which is inserted into an oil passage of an internal combustion engine. In the engine shown in *Amaral*, there are several passages and galleries which are joined together in order to form the lubrication system. As can be seen from FIG. 1 of *Amaral*, the oil is distributed to the engine's main bearings from the main bearing gallery 20 via several secondary passages which each branch off the oil gallery with an angle. The camshaft bearings are supplied with oil by means of right lifter oil gallery 16 and left lifter oil gallery 18 via secondary passages which also each branch off the respective oil gallery with an angle. Thus, the engine described by *Amaral* includes several main oil ducts (main bearing gallery 20, right lifter oil gallery 16 and left lifter oil gallery 18) from which the crankshaft and camshaft bearings are supplied with oil in

contrast to Applicant's invention as recited in claim 27, where there is only one main oil duct for supplying both crankshaft bearings and camshaft bearings.

In *Amaral*, all of the mentioned secondary passages and galleries are straight. There are no individual connection tubes which are each bent and each having a bend from which one section runs to a crankshaft bearing and another section runs to a camshaft bearing so that two different bearings can be supplied with oil by means of only one embedded tube.

It is respectfully submitted, moreover, that the fragmented partial section in FIG. 2 of *Amaral* is not a connection tube in the sense of Applicant's cast part as recited in claim 27 because this fragmented partial section is not a bent tube embedded inside of the crankcase during casting of the latter. Further, sections 14 and 12 of *Amaral* do not run to a camshaft bearing and/or to a crankshaft bearing but instead lead into different oil galleries 18 and 20. Thus, it is respectfully submitted the tube shown in *Amaral* has a completely different arrangement and function compared with Applicant's cast part as recited in claim 27. Thus, the lubrication system described by *Amaral* completely differs from that recited in Applicant's claim 27. Moreover,

Amaral is completely silent as to how the engine block including all oil galleries and oil passages are made.

Thus, it is respectfully submitted that a person of ordinary skill in the art would not be able to arrive at Applicant's cast part as recited in claim 27 or method as recited in claim 48 from a combination of *Masbenden et al. and Amaral* because *Amaral* relates to a completely different kind of oil supply system, and neither *Malsbenden et al.* nor *Amaral* discloses or suggests individual and bent connection tubes (each leading to two different kinds of bearings) and a drilled main oil duct which cuts the connection tubes in order to generate the necessary supply system. Thus, it is respectfully submitted that a person of ordinary skill in the art would not be able to come up with Applicant's cast part as recited in claim 27, or a method for manufacturing a cast part as recited in claim 48 from anything taught by *Malsbenden et al.* or *Amaral*, whether alone or in combination.

The secondary references to *Bing et al. and Stelzer et al.* have been considered but are believed to be no more relevant. None of these references discloses or suggests individual and bent connection tubes each leading to two different kind of

bearings and a drilled main oil duct which cuts the connection tube in order to generate the necessary supply system. Accordingly, it is respectfully submitted that claims 27 and 48, together with claims 28-33 and 49-51, which depend directly or indirectly on claim 27 and 48, respectively, contain patentable and unobvious subject matter.

With respect to the rejection of claims 34-39, the Examiner relies on *Malsbenden et al.* and *Amaral* in combination with *Bing et al.* and *Stelzer et al.* As recited in claim 34 as amended, Applicant's invention provides a cast part for an internal combustion engine wherein a supply line for piston cooling is embedded as an individual tube inside of a crankcase during casting of the latter and is subsequently mechanically opened at determined points for inserting spray nozzles in order to spray oil directed into a cylinder chamber.

In contrast, *Malsbenden et al.* describe only a lubrication system for supplying the crankshaft bearings with oil, which is achieved by means of a pre-manufactured tube system embedded inside of a cast crankcase. In *Malsbenden et al.* no other required locations than crankshaft bearings are mentioned; however, even if a supply line for piston cooling had been

contemplated by *Malsbenden et al.*, that tube would have been part of the pre-manufactured tube system which includes the main oil duct. In addition, *Malsbenden et al.* fails to disclose or suggest subsequently mechanically opening the embedded tube.

Amaral has been discussed above with respect to claims 27-33 and 48-51 and as stated previously relates to a completely different kind of oil supply system.

The defects and deficiencies of *Malsbenden et al. and Amaral* are nowhere remedied by the secondary reference to *Bing et al.*, which likely relates to a device far removed from that to which Applicant's claim 34 as amended is directed because *Bing et al.* does not refer to a cast crankcase. Rather, *Bing et al.* discloses a light metal piston with a channel integrally cast in the piston head, which serves as a cooling channel. The cooling channel described by *Bing et al.* has a completely different function and arrangement than the supply line for piston cooling as recited in Applicant's claim 34 as amended. Therefore, it is respectfully submitted that a person skilled in the art would have no reason to consider *Bing et al.* when confronting the problems of the prior art and could not arrive at Applicant's cast part as recited in claim 34 as amended from anything

disclosed by *Bing et al.* whether alone or in combination with *Malsbenden et al.* and *Amaral*.

Similarly, *Stelzer et al.* fails to disclose or suggest Applicant's cast part for an internal combustion engine as recited in claim 34 as amended, wherein a supply line for piston cooling is embedded as an individual tube inside a crankcase during casting of the crankcase and is subsequently mechanically opened at determined points for inserting spray nozzles in order to spray oil directly into a cylinder chamber.

Accordingly, it is respectfully submitted that claim 34 as amended, together with claims 35 and 38-39 which depend thereon, are patentable over the cited references.

With respect to the rejection of claims 40-43, the Examiner relies on *Malsbenden et al.* and *Amaral* in combination with *Stelzer et al.* As recited in Applicant's claim 40 as amended, a pressurized oil line to the cylinder head is implemented as a tube and is embedded during casting of the crankcase in a pre-determined position. By subsequently introducing the main oil duct through drilling, one end of the oil line is cut so that the connection of the oil line to the oil loop is produced.

In contrast, *Malsbenden et al.* describes only a lubrication system for supplying the crankshaft bearings with oil, which is achieved by means of a pre-manufactured tube system embedded inside of a cast crankcase. In *Malsbenden et al.*, no other required locations than crankshaft bearings are mentioned; however, even if a pressurized oil line would have been contemplated by *Malsbenden et al.*, that tube would have been part of the pre-manufactured tube system which includes the main oil duct. In addition, *Malsbenden et al.* fails to teach subsequently mechanically cutting the embedded tube as discussed previously.

Similarly, neither *Amaral nor Stelzer et al.* shows a pressurized oil line to the cylinder head implemented in the form of a cast in tube. Thus, it is respectfully submitted that a person of ordinary skilled in the art would be unable to arrive at Applicant's cast part as recited in claim 40, as amended, from anything disclosed by the references cited by the Examiner whether alone or in combination. Accordingly, it is respectfully submitted that claim 40 as amended, together with claims 42-43, which depend thereon are patentable over the cited references.

With respect to the rejection of claims 44-47, the Examiner has relied on *Malsbenden et al.* in combination with *Amaral and Stelzer et al.* As recited in claim 44 as amended, Applicant's invention provides a cast part in which a fuel supply line is implemented as an embedded tube. In the course of finishing measures on the cast crankcase (mechanical introduction of openings for fuel pumps), the embedded tube is cut and/or cut through at pre-determined locations.

Malsbenden et al. disclose an embedded lubrication system (embedded pre-manufactured tube system) for supplying the crankshaft bearings with oil. There is no disclosure or suggestion from anything in *Malsbenden et al.* that it could be advantageous to embed a guide duct for another fluid medium (for example fuel) inside of a crankcase, to embed individual tubes instead of a pre-manufactured tube system and to mechanically open the embedded tubes in the course of finishing measures.

Similarly, there is nothing in *Amaral,* which relates to a completely different kind of oil supply system as discussed previously, that would lead one to Applicant's cast part as recited in claim 44 as amended.

Stelzer et al. relates to a fuel injection system for an internal combustion engine with a common rail. The fuel duct 3 is the common rail. The tube-shaped common rail is subsequently arranged in a duct being integrated in the crankcase and being a longitudinal bore for example (column 2, lines 42-59, FIG. 1 of *Stelzer et al.*). Further, there is a space 9 which is surrounding the common rail and serves as a leakage drain. Thus, the crankcase disclosed by *Stelzer et al.* differs from Applicant's cast part as recited in claim 44, as amended, in that there is no fuel line directly embedded inside of the crankcase during casting of the latter. In addition, the common rail is not subsequently cut and/or cut through in order to provide openings for fuel pumps.

Therefore, it is respectfully submitted that a person of ordinary skill in the art would be unable to arrive at Applicant's cast part as recited in claim 44 as amended from anything disclosed by *Malsbenden et al., Amaral and Stelzer et al.* whether alone or in combination. Thus, it is respectfully submitted that claim 44, together with claim 47 which depends thereon, are patentable over the cited references.

In summary, claims 34, 40, 44 and 47 have been amended, and claims 36, 37, 41 and 45-46 have been canceled. In view of the foregoing, it is respectfully requested that the claims be allowed and that this case be passed to issue.

Also enclosed herewith is a Supplemental Information Disclosure Statement.

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Enclosure: Supplemental Information Disclosure Statement

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on December 12, 2007.

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